ICTP – Eurasian Centre for Advanced Research

Annual Report

2015

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ICTP-ECAR is an ICTP partner institute and it is hosted by IZTECH

Introduction

ICTP – Eurasian Centre for Advanced Research (ECAR) is designed as an international centre to serve as a "meeting point" for the scientists, researchers, and students of the broad Eurasia region. It is one of the five regional partner institutions of ICTP (International Centre for Theoretical Physics) that operates with high standards of scientific merit and a mission of fostering the science in developing regions of the globe since 1964. IZTECH (Izmir Institute of Technology) is hosting ICTP-ECAR. The collaboration of ICTP and IZTECH has started back in 2012, and is based on a Memorandum of Understanding.

ICTP-ECAR has started its scientific activities in 2014. In its second year, the Centre has been successful in its mission and we are looking forward to an accelerated development in the coming years.

ICTP-ECAR activities are held at the IZTECH campus. Offices of ICTP-ECAR are located on the first floor of the Department of Mathematics Building. Currently, there are three IZTECH personnel dedicated for the administrative needs of the Centre.

2015 Director's Annual Report is composed of six sections:

Organization and Members
Scientific Activities 2015
Memorandum of Understanding
List of ICTP-ECAR Visitors
Statistical Overview to the Activities in 2015
Scheduled ICTP-ECAR Activities for 2016

In the next few years, the establishment of ICTP-ECAR will be consolidated by inclusion of several research and activity programs and by diversifying its funding sources. One of the priority targets of the Centre will be to acquire the "Category II Institute" label of UNESCO. Continuous support of friends and partners of ICTP-ECAR is crucial for those goals.

Sincerely,
Tuğrul Senger
Acting Director

http://ictp-ecar.org

Organization and Members

Administrative bodies of ICTP-ECAR are the Steering Committee and the Scientific Council. Local coordination of the Centre with the host institution is managed by a unit established under the Rectorate of IZTECH.

Steering Committee

Fernando Quevedo, ICTP Director	Steering Committee Chairman (Ex Officio),
Mustafa Güden, IZTECH Rector	Steering Committee Member (Ex Officio),
Efthimios Kaxiras, Harvard University	Steering Committee Member,
Serdar Sarıçiftçi, Johannes Kepler University	Steering Committee Member,
Cumrun Vafa, Harvard University	Steering Committee Member,
Seifallah Randjbar-Daemi, ICTP	Steering Committee Coordinator (Ex Officio)**,**

Scientific Council

Gabriel Aeppli,	(Chairman), Paul Scherrer Institute
Ignatios Antoniadis,	CERN
Baha Balantekin,	University of Wisconsin-Madison
Nihat Berker,	Sabancı University
Athanasios Fokas,	University of Cambridge
Ramin Golestanian,	University of Oxford
Rahmi Güven,	Boğaziçi University
Klaus von Klitzing,	MPI-Stuttgart
Seifallah Randjbar-Daemi,	(Ex Officio)**,** ICTP
Mehmet Sarıkaya,	University of Washington
Manfred Sigrist,	ETH Zürich

Directorship Office

Tuğrul Senger, Acting Director	IZTECH
Tina Beşeri	Academic Affairs
Koray Sevim	IT Specialist
Canan Nurhan Karahan	Secretary

Scientific Activities 2015

In year 2015 ICTP-ECAR has organized a workshop, a conference, several seminars and colloquia. Annual meeting of the Steering Committee and the Scientific Council has been held in October.

1. Workshop

Workshop on Photonics: Fundamentals & Applications (27-28 August)

Celebrating the International Year of Light and designated as an inauguration of the Department of Photonics at Izmir Institute of Technology, the workshop aimed to bring together theorists and experimentalists working across a wide range of topics, including light-matter interactions, photonic materials, lasers, plasmonics, metamaterials and quantum optics.

More details are described on the web page of the workshop:
http://ictp-ecar.org/events/workshop-on-photonics-fundamentals-applications/

Scientific Committee

Ceyhun Bulutay (Bilkent U.)
Aykutlu Dana (Bilkent U.)
Hilmi Volkan Demir (Bilkent U.)
Salih Dinleyici (IZTECH)
Sıddık İçli (Ege U.)
Naci İnci (Boğaziçi U.)
Ali Serpengüzel (Koç U.)
Raşit Turan (METU)
Ceylan Zafer (Ege U.)

Organizing Committee
Sevilay Sevinçli (IZTECH)
Özgür Çakir (IZTECH)
Serdar Özçelik (IZTECH)
Canan Varlıklı (Ege U.)
Selçuk Aktürk (İstanbul Technical U.)

Invited Speakers
- **Ataç İmamoğlu** (ETH Zurich, Switzerland)
"Quantum optics in condensed matter systems"
- **Asghar Asgari** (RIAPA, Iran)
"Graphene based Solar Cells: future solar cells?"
- **Feridun Ay** (Anadolu U., Turkey)
"Integrated Optical Waveguide Amplifiers and Lasers"
- **Alpan Bek** (METU, Turkey)
"Nonlinear conversion of continuous wave light by Fano resonant all-plasmonic / molecularplasmonic hybrid nanostructures"
- **Vitezslav Benda** (TU Prague, Czech Republic)
"Present development in the field of photovoltaic cells and modules"
- **Iacopo Carusotto** (U. of Trento, Italy)
"Recent advances in topological photonics and fluids of light"
- **Ümit Demirbaş** (Int. Antalya U., Turkey)
"Femtosecond Cr:Colquiriite Lasers with Ultralow Timing Jitter Noise"
- **Harald Hoppe** (TU Ilmenau, Germany)
"Controlling Structural Order and Phase Separation in Polymer:Fullerene Bulk Heterojunction Solar Cells"
- **Alper Kiraz** (Koç U., Turkey)
"Potential of Optofluidic Resonators for Biosensing"
- **Elefterios Lidorikis** (U. of Ioannina, Greece)
"Modelling and design of graphene-based applications in sensing and photodetection"
- **Bülend Ortaç** (Bilkent U., Turkey)
"The Development and Application of High Performance Laser Systems"
- **Jana Zaumseil** (U. of Heidelberg, Germany)
"Light-emitting field-effect transistors as a platform for optoelectronics and plasmonics"

Each morning and each afternoon consisted of two sessions with two talks for 2 days, and there were 30-45-60 minute presentations by invited speakers during the school. There were also poster sessions in the evening involving applications of the lectures. There were 12 invited speakers and 115 participants of the workshop. Participants came from 4 different countries: Turkey, Azerbaijan, India and Iran.

2. Conference

First Joint METU-IPM Conference on LHC Physics (29 September – 03 October)

This meeting focused on the LHC physics as well as upgrades. It intended to introduce the subjects to the young students and scientists of the region. The main experimental and technical topics related to the LHC were reviewed by the leading scientists of the field.

More details are given on the web page of the conference:
http://ictp-ecar.org/events/first-joint-metu-ipm-conference-on-lhc-physics/

Organizing Committee
Hessameddin Arfaei (IPM, Iran)
Buğra Bilin (METU, Turkey)
Mojtaba Mohammadi (IPM, Iran)
Altuğ Özpineci (METU, Turkey)
Saeid Paktinat (IPM, Iran)
Koray Sevim (IZTECH – ICTP-ECAR, Turkey)
Mehmet Tevfik Zeyrek (METU, Turkey) (Chair)

Invited Speakers

- **Altan Cakir** (Istanbul Technical University, Turkey)
"Supersymmetry discovery potential in future LHC and HL-LHC running with the CMS Detector"
- **Shant Baghram** (Sharif University, Iran)
"Theoretical developments/Observational Cosmology"
- **Kerstin Borras** (DESY, Germany)
"Future of LHC and Upgrade of the CMS experiment in Phase 1"
- **Didier Claude Contardo** (CERN – IPNL)
"CMS experiment Upgrade for High Luminosity LHC"

- **Jorgen D'Hondt** (Vrije Universiteit Brussels – IIHE)
"Status of the CMS Experiment"
- **Daniel Denegri** (CEA)
"From W, Z to Higgs"
- **Tulay Cuhadar Donszelmann** (CERN)
"Highlights from ATLAS experiment"
- **Guray Erkol** (Ozyegin University)
"Form factors of charmed hadrons in Lattice QCD"
- **Bora Isildak** (Ozyegin University)
"Jet Measurements in CMS"
- **Mohsen Khakzad** (IPM)
"The CMS-TOTEM Precision Proton Spectrometer"
- **Shaban Khalil**, Zwail City of Science and Technology
"Non-Minimal Supersymmetric Standard Model in light of LHC results"
- **Vanina Ruhlmann-Kleider**, CEA
"Recent progress in cosmology"
- **Olga Kodolova**, Moscow University
"QCD Physics with CMS Detector"
- **Luca Malgeri** , CERN
"Studies and Prospects of Higgs Searches"
- **Alexandre Nikitenko**, Imperial College London
"BSM Higgs Boson Searches"
- **Altug Ozpineci**, METU
"X(3872) and other exotic mesons"
- **Saeid Paktinat**, IPM
"SUSY in ditau final states at CMS"
- **Albert De Roeck**, CERN
"LHC searches and Dark Matter"
- **Sezen Sekmen**, Kyungpook National University
"Status of SUSY after Run 1"
- **Ismail Turan**, METU
"Dark sector effect in neutrino scattering experiments"
- **Ayben Karasu Uysal**, Karatay University
"Hadronic Resonances in Heavy Ion Collisions at LHC"
- **Claudia Wulz**, CERN – HEPHY
"BSM physics after Run 1"

The conference lasted 5 days through which each invited speaker gave a 30-minute talk. There was a poster session on the first day of the conference. A full day excursion to Ephesus was organized for the speakers and participants of the workshop.
There were 55 participants of the conference coming from 3 different countries: Turkey, Egypt, and Iran.

3. Seminars

3.1. Prof. Shaaban Khalil (June 10)

(Zewail City of Science and Technology Egypt)

Title: Zewail City Experience

3.2. Prof. Baha Balantekin (October 6)

(University of Wisconsin – Madison, USA)

Title: Many-neutrino gas in Supernovae: An intersection of Particle and Condensed-matter physics

4. Colloquia

4.1 Prof. Gabriel Aeppli (October 8)

(PSI, ETH Zurich & EPFL)

Title: Physics versus Hospital Superbugs

4.2 Prof. Klaus v. Klitzing (October 8)

(Max-Planck-Institut für Festkörperforschung, Stuttgart)

Title: A New International System of Units in 2018!?
How my Nobel Prize Contributed to this Development

4.3 Prof. Venkatesan Renugopalakrishnan (October 22)

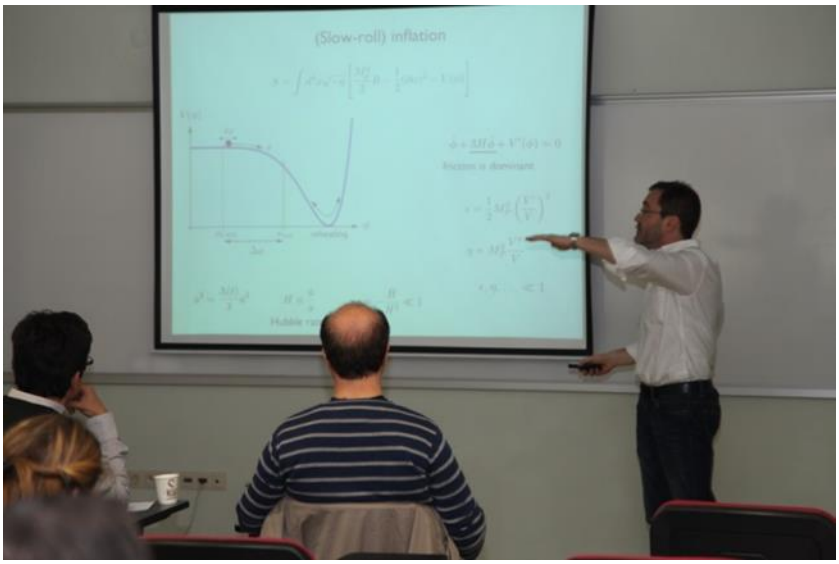
(Boston Children's Hospital, Harvard Medical School, Northeastern Univ.)

Title: Next-Generation Point-of-Care Platform for Quantitative Detection of a Blood Analyte – Towards Personalized Precision Medicine

4.4 Prof. Paolo Creminelli (November 27)

(ICTP, SISSA)

Title: The quest for the beginning



4.5 Prof. Esen Ercan Alp (December 28)

(Advanced Photon Source, Argonne National Laboratory, Argonne Illinois)

Title: Thermodynamics & Elasticity from Inelastic X-Ray Scattering

Memorandum of Understanding

ICTP-ECAR has signed collaboration documents with two research centres.

1. MoU with RIAPA (Iran)

ICTP-ECAR and The Research Institute for Applied Physics & Astronomy (RIAPA) at University of Tabriz – Iran have signed a memorandum of understanding for exchange of researchers.

2. MoU with CFP (Egypt)

ICTP-ECAR and The Center for Fundamental Physics (CFP) at Zewail City of Science and Technology in Cairo – Egypt have signed a memorandum of understanding to encourage and promote scientific collaborations between CFP and ICTP-ECAR scientists.

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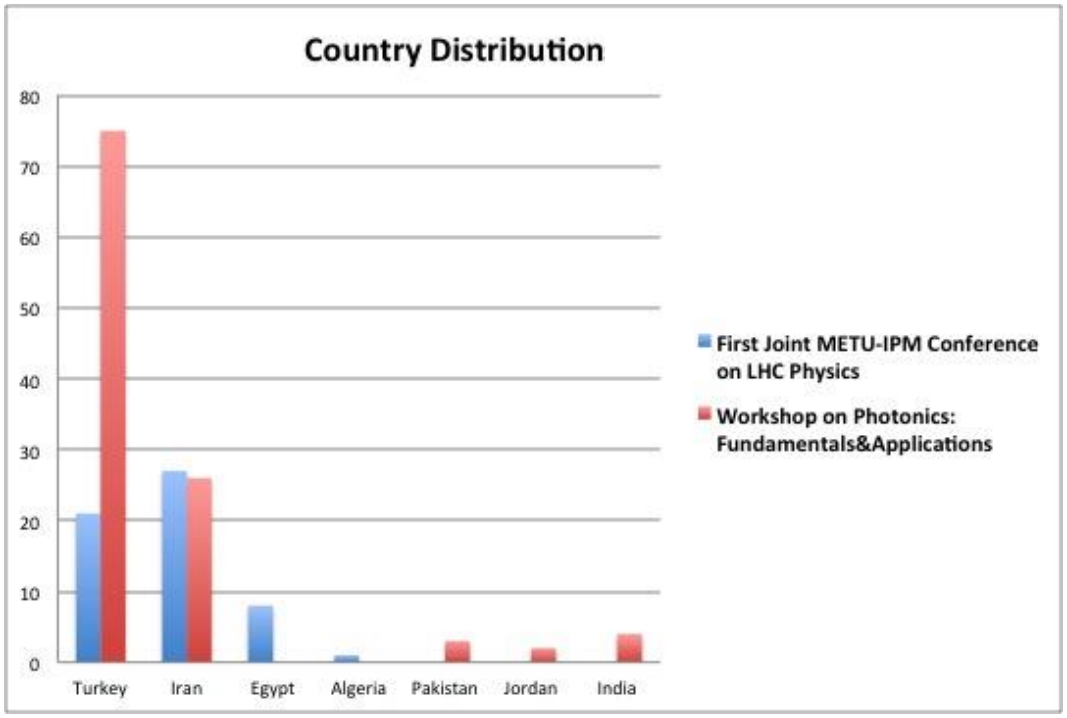
Visitors of ICTP-ECAR in 2015

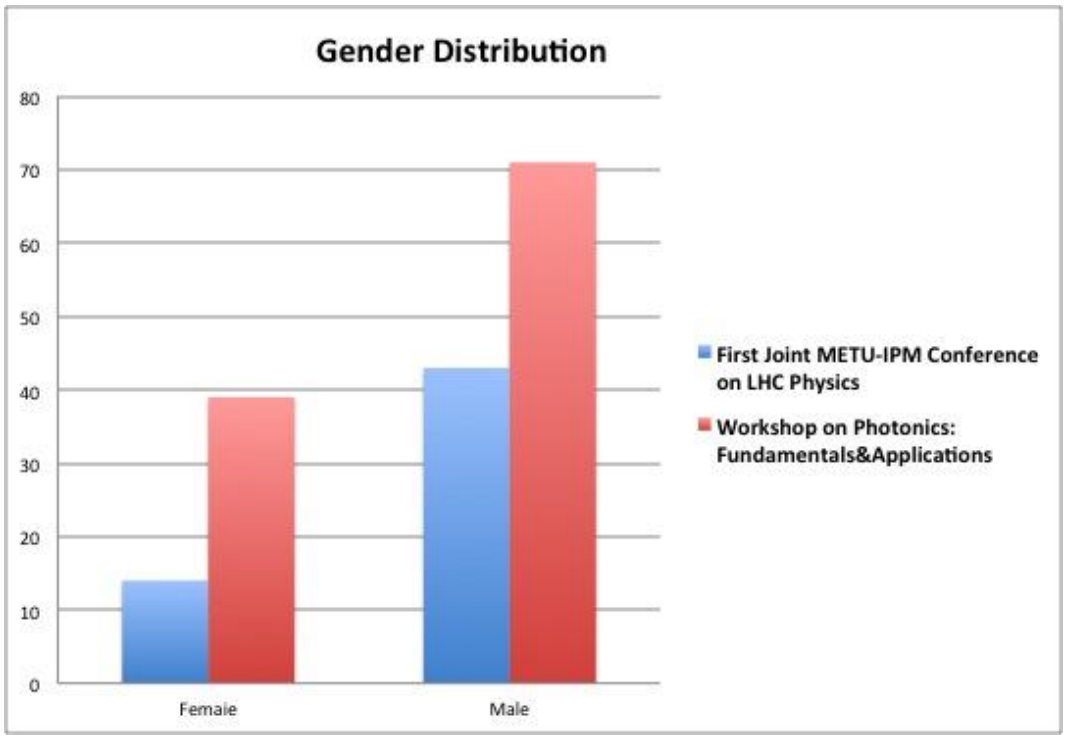
Name	Home Institution	Period of Visit
Shaaban Khalil	Zewail City of Science and Technology, Egypt	June 08-16
Ataç İmamoğlu	ETH Zurich, Switzerland	August 27-28
Feridun Ay	Anadolu U.	August 27-28
Alpan Bek	METU, Turkey	August 27-28
Asghar Asgari Tokaldani	RIAPA, Iran	August 27-28
Aykutlu Dana	Bilkent U., Turkey	August 27-28
Bülend Ortaç	Bilkent U., Turkey	August 27-28
Ceyhun Bulutay	Bilkent U., Turkey	August 27-28
Elefterios Lidorikis	U. of Ioannina, Greece	August 27-28
Harald Hoppe	TU Ilmenau, Germany	August 27-28
Iacopo Corusotto	U. of Trento, Italy	August 27-28
Jana Zaumseil	U. of Heidelberg, Germany	August 27-28
Vitezslav Benda	TU Prague, Czech Republic	August 27-28
Rajesh Velayudhan Nair	Indian Institute of Technology, Ropar	August 27-28
Hodjat Hajian	Bilkent U., Turkey	August 27-28
Mahdi Shayganmanesh	Iran University of Science and Technology	August 27-28
Saeid SHOJAEI	University of Tabriz, Iran	August 27-28
Alper Kiraz	Koç U., Turkey	August 27-28
Ümit Demirbaş	Int. Antalya U., Turkey	August 27-28
Canan Varlıklı	Ege U., Turkey	August 27-28
Ceylan Zafer	Ege U., Turkey	August 27-28
Seydi Yavaş	FiberLast, Turkey	August 27-28
Onur Kuzucu	Aselsan	August 27-28
Aziz Kolkıran	İzmir Katip Çelebi U., Turkey	August 27-28
Hamed Bakshian	IPM, Iran	Sep. 29 – Oct. 3
Altan Cakir	İTU, Turkey	Sep. 29 – Oct. 3
Shant Baghram	Sharif University, İran	Sep. 29 – Oct. 3
Kerstin Borras	DESY, Germany	Sep. 29 – Oct. 3
Didier Claude Contardo	CERN – IPNL, Switzerland	Sep. 29 – Oct. 3
Jorgen D'Hondt	Vrije Universiteit Brussels	Sep. 29 – Oct. 3
Daniel Denegri	CEA, France	Sep. 29 – Oct. 3
Tulay Cuhadar Donszelmann	CERN, Switzerland	Sep. 29 – Oct. 3
Guray Erkol	Ozyegin University, Turkey	Sep. 29 – Oct. 3
Bora Isildak	Ozyegin University, Turkey	Sep. 29 – Oct. 3
Mohsen Khakzad	IPM, Iran	Sep. 29 – Oct. 3
Shaban Khalil	Zwail City of Science and Technology, Egypt	Sep. 29 – Oct. 3
Vanina Ruhlmann-Kleider	CEA, France	Sep. 29 – Oct. 3
Olga Kodolova	Moscow University, Russia	Sep. 29 – Oct. 3
Luca Malgeri	CERN, Switzerland	Sep. 29 – Oct. 3
Alexandre Nikitenko	Imperial College London, UK	Sep. 29 – Oct. 3
Altug Ozpineci	METU, Turkey	Sep. 29 – Oct. 3
Saeid Paktinat	IPM, Iran	Sep. 29 – Oct. 3
Albert De Roeck	CERN, Switzerland	Sep. 29 – Oct. 3
Sezen Sekmen	Kyungpook National University	Sep. 29 – Oct. 3
Ismail Turan	METU, Turkey	Sep. 29 – Oct. 3

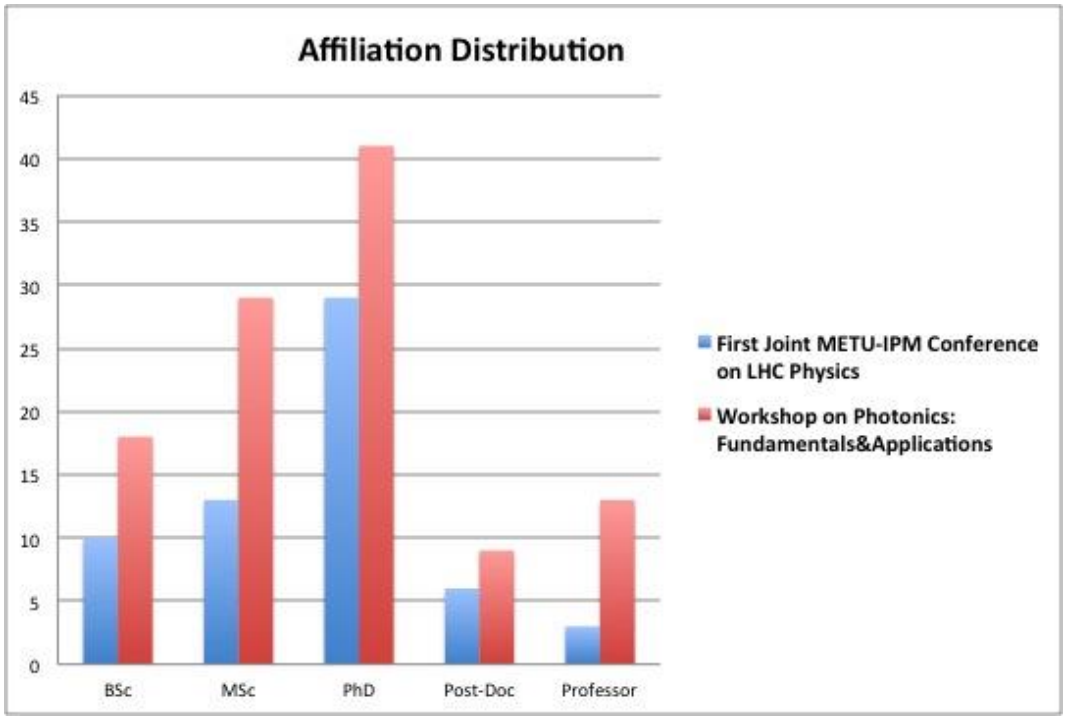
Ayben Karasu Uysal	Karatay University	Sep. 29 – Oct. 3
Claudia Wulz	CERN – HEPHY	Sep. 29 – Oct. 3
Tahmasib Aliev	METU, Turkey	Sep. 29 – Oct. 3
Farhad Ardalan	IPM, Iran	Sep. 29 – Oct. 3
Ali Ulvi Yilmazer	Ankara U., Turkey	Sep. 29 – Oct. 3
Baha Balantekin	University of Wisconsin – Madison, USA	October 03-10
Gabriel Aeppli	PSI, ETH Zurich & EPFL	October 08-09
Klaus v. Klitzing	Max-Planck-Institut für Festkörperforschung, Stuttgart	October 08-09
Mehmet Sarikaya	University of Washington	October 08-09
Rahmi Güven	Boğaziçi University	October 08-09
Ignatios Antoniadis	CERN	October 08-09
Venkatesan Renugopalakrishnan	Boston Children's Hospital, Harvard Medical School, Northeastern Univ.	October 21-22
Paolo Creminelli	ICTP, Italy	November 26-27
Esen Ercan Alp	Advanced Photon Source, Argonne National Laboratory, Argonne Illinois	December 28-29

Statistical Overview of the Activities in 2015

Country, gender, and affiliation distribution of the participants are given below.




Gender Distribution
80
70
60
50
40
30
20
10
0
Female
Male
First Joint METU-IPM Conference on LHC Physics
Workshop on Photonics: Fundamentals&Applications


Affiliation Distribution
45
40
35
30
25
20
15
10
5
0
BSc
MSc
PhD
Post-Doc
Professor
First Joint METU-IPM Conference on LHC Physics
Workshop on Photonics: Fundamentals&Applications

Scheduled ICTP-ECAR Activities for 2016

1. **Workshop: Disorder, Interactions, Turbulence and Wave Dynamics: Fundamentals and Applications (02/05/2016-06/05/2016)**

   The study of interacting wave propagation and localization in disordered media is a fundamental problem having strong interdisciplinary links with a range of practical applications. Photonics is one of the examples where the ideas and concepts originating in the theory of disordered systems and solid-state physics found numerous research demonstrations and engineering applications. In particular, the concept of random lasers has attracted a great deal of attention in recent years. At the same time, general advances in photonic technologies have created new opportunities both for the fundamental studies of disordered systems and for applications and development of new concepts in photonics. A prominent example is the recent emerging field of invasive vision through random opaque media. Nonlinear effects in discrete and disordered systems are expected to lead to new interesting phenomena and photonic manifestations of classical physical effects from solitons to turbulence. In essence, wave turbulence approaches describing the state of the system with many degrees of freedom far from thermal equilibrium can be applied in many problems far beyond its origin in fluid mechanics, resulting recently in such applications like laminar and turbulent laser generation.

   For further information about the activities please visit http://ictp-ecar.org/events/ditw/

2. **School: Density Functional Theory Based Tight Binding Methods (19/07/2016-22/07/2016)**

   Computational techniques have proven to provide indispensable insights into the properties of materials and phenomena associated with their design, synthesis and processing and have expanded our understanding significantly. The density functional based tight binding (DFTB) method is based on expansions of the Kohn-Sham total energy in density functional theory (DFT) with respect to charge density fluctuations. Furthermore, by self-consistent redistribution of charges (SCC), DFTB can be successfully applied to problems, where deficiencies within standard tight binding approach become obvious. As a result, fairly accurate simulations of large systems and long-time scales can be achieved with DFTB.
   Using DFTB, one can include spin polarization, charged systems, long range interactions, quantum mechanics-molecular mechanics coupled simulations, time dependent simulations, Green's function approach for calculating quasiparticle energies (GW), and nonequilibrium Green's function method for quantum transport (NEGF).
   During the workshop, lectures presenting the theoretical framework will be complemented with hands-on sessions and experts will present their recent works using the DFTB methodology.
   The participant profile is fourth year undergraduate or graduate students of physics, chemistry and materials science, researchers involved in computational condensed matter physics, computational materials science, and computational chemistry.

   For further information about the activities please visit http://ictp-ecar.org/events/dftb/

3. Workshop: Physical, Biological and Chemical Foundations of Bioelectronics, Biophotonics and Biosensors (26/07/2016-29/07/2016)

Under the auspices of ICTP-ECAR, the goal of the proposed workshop is to bring together the experts and interested parties to interrogate and discover a set of crucial bio-chemical parameters that correlate fundamentally with the physical electromagnetic phenomena in bioinspired, biomimetic and biological systems with an emphasis on addressing the needs for future practical implementations in technology and medicine.

For further information about the activities please visit http://ictp-ecar.org/events/pbcb/

4. Workshop: High Energy Physics Workshop (06/09/2016-09/09/2016)

The aim of the conference is to cover as many topics as possible from different branches of particle physics, ranging energy frontier studies to intensity frontier efforts as well as studies related to cosmological anomalies. While the recent progresses made in these areas will be discussed by senior scientists, this conference will also provide an environment for young students to get involved with the hop topics of the field.

The plan is to cover as many directions as possible taken by current studies. Taking the fact that there is no sign of new physics at LHC as energy frontier, alternative scenarios become relevant more than ever. The current status of the physics being searched at LHC, including Higgs properties, supersymmetry, extra dimensions, top physics etc., will be reviewed by the experts in the meeting and the future prospects will be discussed. Additionally, efforts searching new physics at low energy but high intensity frontiers will be presented, covering B physics, neutrino physics, dark matter, etc., and the status of the current and proposed experiments along these lines. The LHCb experiment has found various new bound states, creating some excitement in the community. So, the recent theoretical and experimental status of hadronic physics is explored. There are many data coming out from satellite experiments in the sky indicating various anomalies. These will also be covered in the conference. Considering the current status of the precision required, the use of High Energy Physics computational tools becomes indispensable and there has been significant progress, which is planned to be presented in the meeting.

For further information about the activities please visit http://ictp-ecar.org/events/hepw/

5. School (External Activity in Granada, Spain): Hands-on Summer School on Cosmology Tools, CosmoTools16: Galaxy Clustering with Large Surveys (01/09/2016-10/09/2016)

CosmoTools16 will be a hangs-on school targeted to teach and train graduate students in the field of cosmology with LSS surveys, with a particular focus in galaxy clustering. We also aim to schedule a series of Keynote presentations that will complement the planned Lectures and feed in student's knowledge in the subject.